Intelect®/GENiSYS®

Ultrasound Therapy Systems

SERVICE MANUAL



Ultrasound Therapy System Models:

2776 - Serial numbers 1000 and above
2782 - Serial numbers 1000 and above
2792 - Serial numbers 1000 and above

CHATTANOOGA GROUP A DIVISION OF encore MEDICAL

ISO 13485 CERTIFIED

TABLE of CONTENTS

Read, understand and follow the Safety Precautions and information contained in this manual.

This manual contains the necessary safety, and field service information for those Field Service Technicians, approved by Chattanooga Group, to perform field service on the Intelect/Genisys Ultrasound Therapy Systems.

At the time of publication the information contained herein was current and up to date. However, due to continual technological improvements and increased clinical knowledge in the field of electrotherapy, as well as Chattanooga Group's policy of continual improvement, Chattanooga Group reserves the right to make periodic changes and improvements to their equipment and documentation without any obligation on the part of Chattanooga Group.

It is the sole responsibility of field technicians to stay informed and trained in the latest technology utilized in the Intelect/Genisys Ultrasound Therapy Systems by Chattanooga Group. From time to time, as significant improvements are incorporated, Service Bulletins will be produced and made available on our web site (www.chattgroup.com) in lieu of reprinting a complete manual prematurely. These Service Bulletins will provide updated service information and technology improvements to the Intelect/Genisys Ultrasound Therapy Systems for use by certified service technicians.

"Certified Service Technician" Definitions;

1. Level I- Those Field Service Technicians that have successfully completed the minimal training required by Chattanooga Group in basic service techniques.

2. Level II- Those Field Service Technicians that have successfully completed Level I Training as well as Level II training as required to perform specific troubleshooting and repair techniques and procedures.

3. Level III- Those Field Service Technicians that have successfully completed Levels I & II Training as well as Level III Advanced Training as required to perform all necessary Troubleshooting and Repair techniques. The Technician having successfully completed the three levels of training and coupled with experience should have the ability to train other technicians in Level I and Level II Training with the necessary Training Materials from Chattanooga Group.

4. Temporary- Chattanooga Group, at its discretion and based on known experience of the technician, may grant a "Temporary Certification" to a field technician for particular troubleshooting and repair of a specific system requiring immediate attention. This "Temporary Certification" in no fashion acknowledges the training level of a technician as defined above. This "Temporary Certification" is utilized only in unique situations for a specific unit for a specific service technique only and is documented as such.

Due to the complex nature of the technology utilized by Chattanooga Group, the recommended troubleshooting techniques are to determine "Bad Board" and board replacement only. No board component level troubleshooting is recommended nor will information or parts be supplied by Chattanooga Group. Any board component level troubleshooting performed will be at sole risk and liability of the Service Technician performing such troubleshooting techniques.

This equipment is to be used only under the prescription and supervision of a licensed medical practitioner.

This equipment is to be serviced only by a "Certified Service Technician".

1.1 Precautionary Symbol Definitions

The precautionary instructions found in this manual are indicated by specific symbols. Understand these symbols and their definitions before operating or servicing this equipment. The definitions of these symbols are as follows;

A. CAUTION

⚠ CAUTION

Text with a “CAUTION” indicator will explain possible safety infractions that have the potential to cause minor to moderate injury or damage to equipment.

B. WARNING

⚠ WARNING

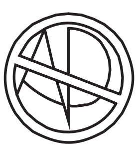
Text with a “WARNING” indicator will explain possible safety infractions that will potentially cause serious injury and equipment damage.

C. DANGER

⚠ DANGER

Text with a “DANGER” indicator will explain possible safety infractions that are imminently hazardous situations that would result in death or serious injury.

D. EXPLOSION HAZARD



Do not use this equipment in the presence of flammable anesthetics. This symbol is also prominently displayed on the serial number plate of the unit.

E. DANGEROUS VOLTAGE



Text with a “Dangerous Voltage” indicator serves to inform the Service Technician of possible hazards resulting in the electrical charge retained by faulty power supplies.

F. CORROSIVE HAZARD (NiMH Battery)



Text with a “Corrosive Hazard” indicator will explain possible safety infractions if the chemical components of this product are exposed to air, skin or other materials.

G. NOTE:

Throughout this manual “NOTE” may be found. The Notes are helpful information to aid in the particular area or function being described.

1.2 Safety Precautions

Read, understand and follow all safety precautions found in this manual. Below are general safety precautions that must be read and understood before attempting any service techniques on these units. Throughout this manual specific safety precautions will be found. Read, understand and follow all safety precautions.

⚠ CAUTION

- Read, understand and practice the precautionary and operating instructions. Know the limitations and hazards associated with using any ultrasound device. Observe the precautionary and operational decals placed on the unit.
- DO NOT operate the Intelect or Genisys when connected to any unit other than Chattanooga Group devices. Do not operate the unit in an environment of short-wave diathermy use.
- The Ultrasound modality should be routinely checked before each use to determine that all controls function normally; especially that the intensity control does properly adjust the intensity of the ultrasonic power output in a stable manner. Also, determine that the treatment time control does actually terminate ultrasonic power output when the timer reaches zero.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to ultrasonic energy.
- DO NOT use sharp objects such as a pencil point or ballpoint pen to operate the buttons on the control panel as damage may result.
- Operate, transport and store this unit in temperatures between 59 °F and 104 °F (15 °C and 40 °C), with Relative Humidity ranging from 30%-60%.
- Inappropriate handling of, and subjecting the ultrasound applicator to physical abuse, may adversely affect its characteristics.
- Inspect Sound Head for cracks, which may allow the ingress of conductive fluid before each use.
- Inspect all cables, leads and associated connectors before each use.

2.1 Overview

The Intelect/Genisys Ultrasound Therapy Systems are comprised of several PC board assemblies housed within a common enclosure. These assemblies each support a distinct function in the product. The basic elements are User Interface, Control Board, Ultrasound Board, Ultrasound Applicator, and Power Supply Circuits.

2.2 Power Supply Circuits

A universal input power supply provides all parts of the system with 12 volts DC. The supply is connected to the mains at all times when the cord is attached. The power switch on the top of the unit, switch the 12V output of the power supply to the different components in the system by way of the Power Distribution Board. The 12V supply is regulated locally at each PC board as required.

2.3 Control Board

The Control Board serves just as its name implies. It controls the operation of the ultrasound board, user interface and optional accessories. The control board communicates to the ultrasound board through a proprietary 8-bit parallel bus. The control board drives the display. The control board reads the menu buttons. The control board also reads the amplitude and the contrast control on the system. Sound output is generated by the control board and routed to an internal speaker.

2.4 Ultrasound Board and Applicator

The ultrasound board generates the 1 or 3.3 MHz output to drive the ultrasound Sound Head. The ultrasound board is accessed much like an I/O port by the control board. It can provide current and voltage information about the ultrasound output of the board. The calibration data for the Sound Head is passed through the ultrasound board from the applicator up to the control board. By storing the calibration data in the applicator there is no calibration necessary for the ultrasound board. Calibrated Chattanooga Group Ultrasound Applicators, designed specifically for the Intelect/Genisys Ultrasound Therapy Systems, can be connected and operated to provide accurate coupling and output.

2.5 User Interface and Accessories

The LCD display panel provides the operator visible feedback in the way of menu choices. Pressing the menu buttons makes selections from the menus. The control board interprets these user inputs and responds accordingly. Audible feedback is given as well for events such as keypresses and end of treatment.

The Optional Battery mounts in the system bottom and supplies 24 VDC to the power supply. The Power Supply distributes the power required to the system as needed. The charging circuit for the battery is incorporated on the Control PCB. An icon on the display reflects the available amount of charge in the battery. When the system is connected to an approved power outlet and a battery is installed in the system, the system will charge the battery to full capacity. The incorporated charger will not overcharge the battery.

3- NOMENCLATURE

3.1 Intelect/Genisys Ultrasound Therapy System

The nomenclature graphics below, Figure 3.1, indicates the general locations of the exterior components of the Ultrasound Therapy System.

Know the components and their functions before performing any operation on or service to the Ultrasound Therapy System.

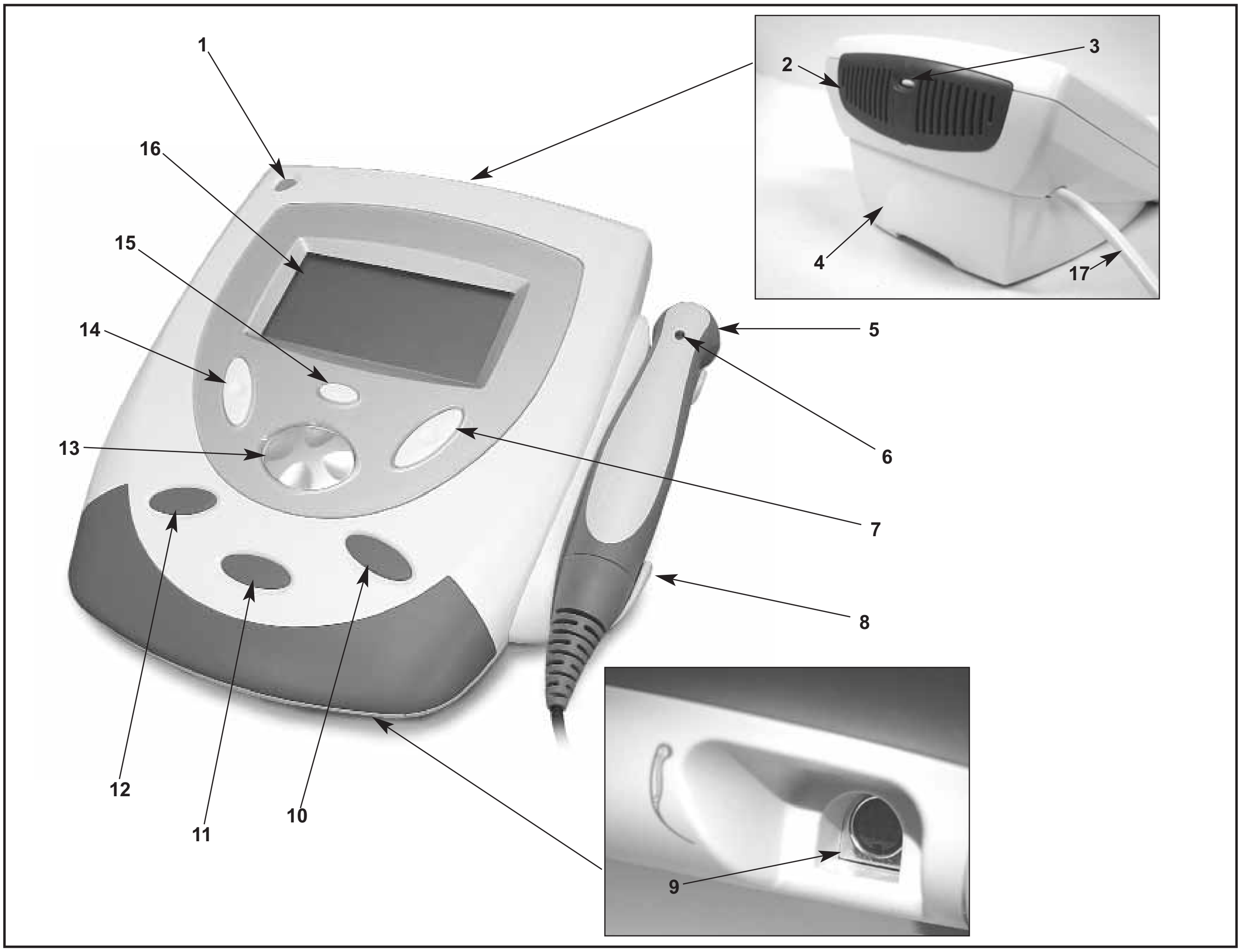


FIGURE 3.1

1. **On/Off Switch-** Turns system On and Off.
2. **Fan Grill-** Allow exhaust of air circulated by system fan.
3. **LCD Contrast Knob-**Adjusts contrast of LCD Display.
4. **Plynth-** Allows for wall mounting or sitting on a flat surface.
5. **Ultrasound Applicator-** Used to administer Ultrasound Therapy to patient.
6. **Applicator LED Indicator-** Flashes 5 times upon connecting applicator to system. Illuminates constantly when applicator is coupled to patient treatment area.
7. **Ultrasound Intensity Button-** Used to increase and decrease ultrasound output intensity.
8. **Ultrasound Applicator Hook-** Used to store applicator when not in use.
9. **Ultrasound Applicator Connector-** Used to connect the Ultrasound Applicators to the System
10. **Treatment Start Button-** Press to start therapy session.
11. **Treatment Pause Button-** Press to pause therapy session. Press again to continue session.
12. **Treatment Stop Button-** Press to completely stop therapy session.
13. **Multi-Control Button-** Press the respective icon on this button to change parameters and to scroll through Clinical Resources Library
14. **Treatment Time Button-** Press to adjust treatment time up or down.
15. **Clinical Resources Library Button-** Press to access the Clinical Resources Library.
16. **LCD Display-** Displays necessary information for operation and maintenance.
17. **Mains Power Cord-** Connects system to required electrical outlet.

Not Illustrated- Battery Access Cover located beneath the plynth.

3.2 Intelect/Genisys Ultrasound Symbol Definitions

The graphic symbols listed below can be found on the Ultrasound Therapy System and within the software.

Become familiar with these symbols and their definitions prior to any operation, mainteneance or repairs of the system.

On/Off Switch- Flashes when plugged into power outlet. Illuminates steady when system is On

Stop Treatment- Press to stop therapy session.

Pause Treatment- Press to pause therapy session and retain time remaining. Press again to continue therapy session

Start Treatment- Press to start therapy session

Increase- Found in two locations on the system, press to increase session time and/or ultrasound intensity respectively.

Decrease- Found in two locations on the system, press to decrease session time and/or ultrasound intensity respectively.

Clinical Resources- Press to access the Clinical Resourses area of the system software.

Ultrasound Applicator- Indicates connector for the ultrasound applicators.

Charge Level- This icon indicates the charge level of the battery, if installed.

Battery Charging- Indicates the system is charging the battery when plugged into power outlet.

Treatment Time- Press the Increase or Decrease symbol to adjust ultrasound treatment time to the prescribed level.

Head Warming- Press to turn Off or On the Head Warming feature of the system.

Frequency Press to change frequency to 3.3 MHz or 1MHz

W / W/cm²

Intensity Display- Press to display “Watts” or “Watts per cm^2“ for the output of the ultrasound.

Intensity Control- Press the Increase or Decrease symbol to adjust ultrasound intensity to the prescribed level.

Duty Cycle- Press to select and display the Duty Cycle of the Ultrasound as prescribed. Options avaliable are: 10%, 20%, 50, or Continuous (100%).

LCD Display Contrast- Located on the Fan Grill, this indicates the control to increase or decrease the LCD Display contrast.

Back- Press to return back one screen on the LCD Display.

Scroll Up- Press to scroll up when making menu selections

Scroll Down- Press to scroll down when making menu selections

Accept & Return- Press to accept menu selection and to return to the Home Screen

4.1 Intelect/Genisys Ultrasound Therapy System Physical Specifications

A. Dimensions

1. 28.8 cm (11.3") Width
32.8 cm (12.9") Depth
16.3 cm (6.4") Height

2. 2.3 kg (5.07 lbs) with 5 cm^2 Applicator and Plynth

3. Case Material: Polycarbonate Plastic

4. Optional Battery Weight: 0.85 kg (1.87 lbs)

B.Outputs

One Ultrasound Output

C. Ultrasound Applicator Sizes Available

1. 1 cm^2

2. 2 cm^2

3. 5 cm^2 (Standard)

4. 10 cm^2

D. Power Input Requirements

1. 100-240VAC, 50/60 Hz, 75W

4.2 Intelect/Genisys Ultrasound Specifications

Frequency . . . . . 1 MHz, +/- 5%; 3.3 Mhz, +/- 5%

Duty Cycles . . . . . 10%, 20%, 50%, Continuous

Pulse Frequency 100Hz

Pulse Duration . . . . . 1mSec, +/-20%
2mSec, +/-20%
5mSec, +/-20%

Output Power

10cm^2 Crystal . . . . . 0-20 Watts at 1MHz
0-10 Watts at 3.3 MHz

5cm^2 Crystal. . . . . 0-10 Watts, 1 and 3.3 MHz

2cm^2 Crystal. . . . . 0-4 Watts, 1 and 3.3 MHz

1cm^2 Crystal . . . . . 0-2 Watts 3.3 MHz Only

Amplitude . . . . . 0 to 2.5 w/cm^2 in continuous mode,
. . . . . 0-3 w/cm^2 in pulsed modes

Output accuracy. . . . . +/- 20% above 10% of maximum

Temporal Peak to Average Ratios: . . . . . 2:1, ± 20%, at 50% Duty Cycle
5:1, ± 20%, at 20% Duty Cycle
9:1, ± 20%, at 10% Duty Cycle

Beam Nonuniformity Ratio. . . . . 5.0 : 1 maximum

Beam Type . . . . . Collimating

Effective Radiating Areas. . . . . 10cm^2 Crystal - 8.5cm^2, +/- 1.5
. . . . . 5 cm^2 Crystal - 4.0cm^2, +/- 1.0
. . . . . 2cm^2 Crystal - 1.8cm^2, +0.2/-0.4
. . . . . 1cm^2 Crystal - 0.8cm^2, +0.2/-0.4

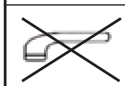
Treatment Time . . . . . 1-60 Minutes

Ultrasound Head Warming Feature. . . . . 50% of maximum output until Crystal Temp reaches approx. 38 °C (100 °F) then 10% of maximum or Off to maintain Temperature

5.1 Intelect/Genisys Ultrasound Software Error Messages

A. The information provided below is intended to aid in defining the Software Error Messages of the Ultrasound Therapy System. Once a particular Error Message is defined the information will also list probable causes and possible remedies. Once the problem area is determined subsequent diagnostics for verification will be necessary to determine “Bad Board”. All diagnostic tests will be to validate a “Bad Board” only. No component level troubleshooting information is or will be provided by Chattanooga Group for field troubleshooting of board components. Error messages in the range of 100 to 199 are primarily user definable and remedied by following the instructions given by the unit. Error meesages in the ranges of 200- 299 and 300-399, require the attention of a field technician certified by Chattanooga Group in order to perform the necessary diagnostics and properly replace any necessary components.

B. Once a particular PCB has been determined as bad, refer to the appropriate Removal and Replacement Section for the board affected for proper instructions for replacement of the board.

CODE No.	TYPE MESSAGE	PROBABLE CAUSES	POSSIBLE REMEDIES
	**Icon-** Sound Head overtemp	**1.** Sound Head has overheated to a temperature that could cause damage to the crystal.	**A.** Turn Off Head Warming feature. **B.** Allow Sound Head to cool before continuing therapy. **C.** Connect a known good Applicator to the system and try again. If system works properly, re-calibrate Applicator or replace with new Applicator.
	**Icon-** No applicator plugged into system	**1.** Applicator not plugged into system connector.	**A.** Plug Applicator into system.
		2. Applicator connector not completely seated in system connector.	**A.** Make certain Applicator connector is completely seated in system connector.
		3. Applicator Cable disconnected from Applicator PCB.	**A.** Connect Applicator Cable to Applicator PCB
		4. Applicator cable damaged.	**A.** Replace with new Applicator.
		5. Applicator not calibrated	**A.** Calibrate Applicator.
		6. Bad Ultrasound Board	**A.** Replace Ultrasound Board
100	**WARN_US_UNPLUGGED** Technician attempted to calibrate an ultrasound applicator but none is plugged into system.	**1.** Applicator not plugged into system connector.	**A.** Plug Applicator into system.
		2. Applicator connector not completely seated in system connector.	**A.** Make certain Applicator connector is completely seated in system connector.
		3. Applicator Cable disconnected from Applicator PCB.	**A.** Connect Applicator Cable to Applicator PCB
		4. Applicator cable damaged.	**A.** Replace with new Applicator.
101	**WARN_US_APPL_ BECAME_UNPLUGGED** Applicator came unplugged from system while administering therapy.	**1.** Applicator not plugged into system connector.	**A.** Plug Applicator into system.
		2. Applicator connector not completely seated in system connector.	**A.** Make certain Applicator connector is completely seated in system connector.
		3. Applicator Cable disconnected from Applicator PCB.	**A.** Connect Applicator Cable to Applicator PCB
		4. Applicator cable damaged.	**A.** Replace with new Applicator.

5.1 Intelect/Genisys Software Error Messages (Continued)

CODE No.	TYPE MESSAGE	PROBABLE CAUSES	POSSIBLE REMEDIES
200	**ERR_EEPROM** Error accessing the internal EEPROM used to store system configuration settings and protocols.	**1.** Bad Control Board	**A.** Replace Control Board.
201	**ERR_APPL_SAVE_CAL_ DATA** Error attempting to save data to applicator EEPROM during applicator calibration.	**1.** Bad Applicator	**A.** Replace with known good Applicator.
		2. Bad Applicator Cable	**A.** Replace with known good Applicator.
		3. Applicator PCB Connector Bad	**A.** Replace Ultrasound Board.
		4. Bad Ultrasound Board	**A.** Replace Ultrasound Board.
202	**ERR_APPL_NOT_ CALLED_OK** General error attempting to calibrate an applicator.	**1.** Bad Applicator	**A.** Replace with known good Applicator.
		2. Bad Applicator Cable	**A.** Replace with known good Applicator.
		3. Applicator PCB Connector Bad	**A.** Replace Ultrasound Board.
		4. Bad Ultrasound Board	**A.** Replace Ultrasound Board.
203	**ERR_APPL_SAVE_ TIMEOUT** Error attempting to save data to applicator EEPROM during applicator calibration	**1.** Bad Applicator	**A.** Replace with known good Applicator.
		2. Bad Applicator Cable	**A.** Replace with known good Applicator.
		3. Applicator PCB Connector Bad	**A.** Replace Ultrasound Board.
		4. Bad Ultrasound Board	**A.** Replace Ultrasound Board.

5.1 Intelect/Genisys Software Error Messages (Continued)

CODE No.	TYPE MESSAGE	PROBABLE CAUSES	POSSIBLE REMEDIES
300	**CRIT_ERR_US_BOARD** Some type of critical ultrasound board error has occurred.	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.
301	**CRIT_ERR_US_BOARD_ NOT_DETECTED** No ultrasound board is detected in unit.	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.
302	**CRIT_ERR_US_RESET** Ultrasound board has reset for some unknown reason.	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.
303	**CRIT_ERR_US_BOARD_ READ** Error reading from ultrasound board.	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.
304	**CRIT_ERR_US_ BOARD_WRITE** Error writing to ultrasound board	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.
305	**CRIT_ERR_US_BOARD_ CALIBRATION_ERROR** Error calibrating applicator	**1.** Ultrasound Board to Control Board Connecting Header loose or disconnected.	**A.** Reseat Connecting Header into Control Board.
		2. Bad Ultrasound Board.	**A.** Replace Ultrasound Board.
		3. Bad Control Board.	**A.** Replace Control Board.

5.2 Intelect/Genisys Ultrasound Diagnostics

A. General

1. The following information is intended to aid in troubleshooting the major components of the Ultrasound Therapy Systems to "Board Level" only. These tests are OEM standard testing procedures and methods used at the factory before shipment of any Ultrasound Therapy System.
2. Due to the complex nature of the technology utilized by Chattanooga Group, the recommended troubleshooting techniques are to determine "Bad Board" and board replacement only. No board component level troubleshooting is recommended nor will information or parts be supplied by Chattanooga Group. Any board component level troubleshooting performed will be at sole risk and liability of the Service Technician performing such troubleshooting techniques.

B. Special Tools, Fixtures & Materials Required

1. Certain tests require the use of special Tools and/or Fixtures. These will be listed at the particular test where they are required. Testing with any other special tool or fixture other than those stated could give erroneous readings or test results. Always perform the tests exactly as stated to ensure accurate results.
2. Any special tools or fixtures required can be obtained through Chattanooga Group, Service Department.
3. Scope and other standard test equipment settings will be listed for each test performed to aid in performing the test to OEM standards and ensure proper readings.
4. The troubleshooting and repair of the Ultrasound Therapy Systems should be performed only by authorized technicians trained and certified by Chattanooga Group.

C. Equipment Required

1. Oscilloscope and Probes
2. Electrotherapy Service Technician Interface (ESTI) Diagnostics Kit.
3. Digital Multimeter
4. Milliohm Meter
5. Dielectric Withstand (Hi-Pot) and ground resistance tester.

NOTE:

Adjust Dielectric Withstand tester to indicate fault with 120k Ohm Load across the output when at specified test voltage.

6. Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter.

NOTE:

The Ohmic Industries UPM DT 10 or UPM DT 100 Ultrasound Power Meters are the only power meters on the market that will meet the strict specifications set forth for Chattanooga Group Ultrasound Products. It is absolutely necessary for the Field Technician to have available and use the Ohmic Industries UPM DT 10 or UPM DT 100 Power Meter when performing any service or calibration of any Chattanooga Group Ultrasound products.

7. Degassed Water (< 5 ppm) for Ultrasound Power Meter.

Recipe(s) for Degassed Water

1) Boil Distilled Water for 30 minutes. Place water in a nonporous container and immediately cover with cellophane. Allow to cool to room temperature of approximately 21°C (70°F). May be refrigerated to aid cooling time.
2) Bring Distilled Water to a boil. Place the container under vacuum for 5 to 10 minutes.

8. Dissolved Oxygen Test Kit. Used to test oxygen level of degassed water.

NOTE:

Two liter softdrink bottles are ideal storage and transport containers for degassed water as they are designed to keep oxygen out. Do not allow aeration of degassed water during transport or filling of the power meter.

Do not use Tap Water or Distilled water in the Ultrasound Power Meter. Use only Degassed Water in order to obtain correct test results. The chart below illustrates the oxygen content of Degassed, Tap and Distilled Water.

WATER TYPE	ppm of Oxygen
Degassed (per recipe 1 or 2)	Less than 5 ppm
Tap Water	Up to 35 ppm
Distilled Water	Up to 20 ppm

9. Ultrasound Applicators (Intelect/Genisys Accessories).

5.3 Visual Inspection

A. General

Visually inspect the Ultrasound Therapy System. A visual inspection can, to an experienced Technician, indicate possible abuse of the system and/or internal problems.

5.4 Leakage Tests

Conduct all necessary leakage tests as required per "Chapter 7 Electrical Equipment" of the 1999, or later, edition of the NFPA (National Fire Protection Association) "Health Care Facility" standards. See Figure 5.1.

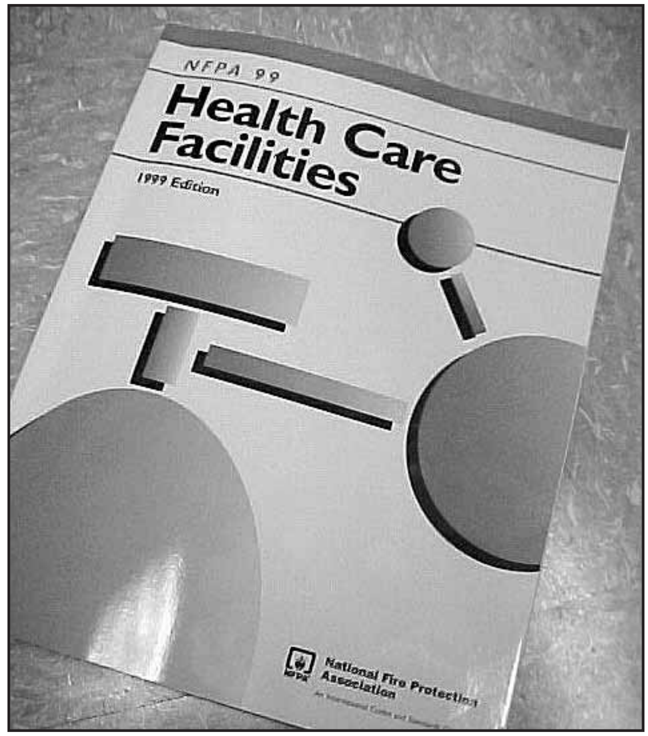


FIGURE 5.1

⚠ WARNING

UNIT FAILING DIELECTRIC WITHSTAND AND/OR LEAKAGE TESTS COULD INDICATE SERIOUS INTERNAL SYSTEM PROBLEMS.
DO NOT PLACE UNIT BACK INTO SERVICE! SEND UNIT TO FACTORY FOR REPAIR! DO NOT ATTEMPT TO REPAIR IN THE FIELD!

5.5 Unit Startup and Fan Testing

A. Equipment Required

1. N/A

B. Test

1. Place unit face up on work surface.
2. Connect power cord to unit and plug into proper power receptacle.
3. Turn system on. Adjust intensity up and press Start. Fan will begin to run after the audible beep tones.
4. Place hand at the back of unit to verify fan is blowing out. See Figure 5.2.

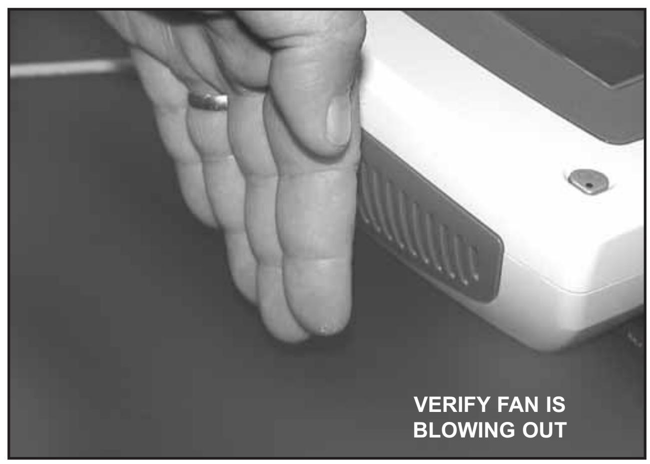


FIGURE 5.2

C. Test Results

1. Unit will not Start= Unit Failed Test
   - **a)** Possible Bad Power Supply
2. Main menu does not display= Unit Failed Test
   - **a)** Possible Bad Control Board
   - **b)** Possible Bad Power Supply
     - **1).** Visually check power button LED. If flashing, Power Supply is good, replace Control Board. If not flashing, replace Power Supply.
3. Fan not blowing outward= Unit Failed Test
   - **a)** Fan Blowing Inward
     - **1)** Fan wired wrong- Rewire or replace fan
   - **b)** Fan not blowing
     - **1)** Possible Bad Fan
     - **2)** Possible Bad Power Supply

5.6 Ultrasound Tests

A. Equipment Required

1. Degassed Water. Refer to page 10 for Degassed Water Recipes.

2. Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter.

3. Dissolved Oxygen Test Kit. Used to test oxygen level of degassed water.

4. Known good Ultrasound Applicator

5.7 Ultrasound Applicator Identification Test

NOTE:

Use any Ultrasound Applicator for this test.

A. Ultrasound Applicator Identification Test Procedures

1. Without Applicator installed, turn unit on.

2. Look at the display center. The Applicator not detected icon should appear. See Figure 5.3.

3. Plug Applicator into Applicator port on the front R.H. corner of the system. Applicator LED should flash five (5) times. See Figure 5.4.

4. Look at the display center. The Applicator detected icon should appear. See Figure 5.5.

B. Ultrasound Applicator Identification Test Results

1. Unit operates as described in steps 2 and 4.

a) Unit passed test.

2. "NO CAL" icon displays center of system display.

a) Applicator not calibrated.

b) Possible bad Applicator. Re-test with known good Applicator.

c) Possible bad Ultrasound PCB.

3. Not detected icon displayed after ten seconds of Applicator being plugged in.

a) Possible bad applicator. Re-test with known good Applicator.

b) Possible bad Ultrasound Board.

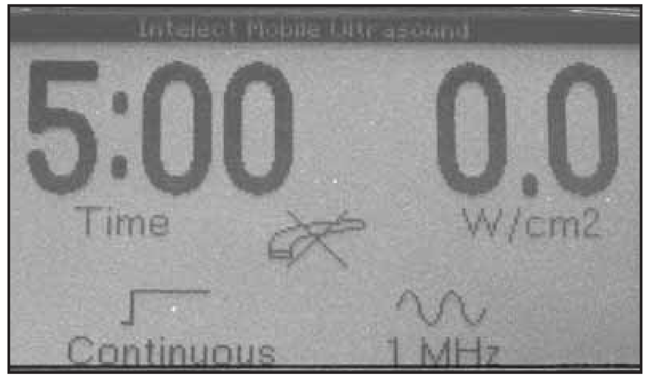


FIGURE 5.3



FIGURE 5.4



FIGURE 5.5

5.8 Ultrasound Applicator Output Test

Perform this test using all available Applicators for the unit being tested.

A. Ultrasound Applicator Output Test Procedures

1. Set up Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter per Operator's Instructions and fill test reservoir with Degassed Water.

⚠ WARNING

USE ONLY DEGASSED WATER IN POWER METER FOR TESTING ULTRASOUND APPLICATORS. USE OF OTHER TYPES OF WATER WILL CAUSE FALSE TEST RESULTS. SEE PAGE 10 FOR DEGASSED WATER RECIPES.

DO NOT AERATE WATER WHEN FILLING POWER METER.

2. Place an Applicator into the Power Meter retainer. As per Ohmic Manual, make certain the Applicator's aluminum face is submerged in the degassed water and centered directly over the S.S. cone.
3. "Zero" the Power Meter.
4. Turn the Ultrasound Therapy System on.
5. Press the ⎍ button until "Continuous" is displayed in the Duty Cycle area of the display.
6. Press the W/W/cm² button until "Watts" appears in the intensity area of the display.
7. Increase Intensity for the applicator being tested according to Figure 5.6
8. Press "Start".
9. Compare Power Meter readings, displayed on power meter for all the settings for each respective applicator being tested to the values in Figure 5.6.
10. Press the ∿ button until "3.3 MHz" is diplayed in the Frequency area of the display. Repeat test and compare readings to Figure 5.6.

B. Ultrasound Applicator Output Test Results

1. Output ranges fall within the specified ranges as listed in Figure 5.6.
   a) Unit passed test.
2. Readings fall outside specified ranges of Figure 5.6.
   a) Possible bad Degassed Water in Power Meter.
   b) Possible use of Power Meter other than Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter.
   c) Possible bad or out of calibration Applicator.
   d) Possible bad Ultrasound Board.

APPLICATOR OUTPUT SPECIFICATIONS

APPLICATOR SIZE	POWER SETTING (WATTS)	OUTPUT RANGE
1 cm²	1	0.8 - 1.2
	2	1.6 - 2.4
2 cm²	1	0.8 - 1.2
	2	1.6 - 2.4
	4	3.2 - 4.8
5 cm²	1	0.8 - 1.2
	2	1.6 - 2.4
	5	4.0 - 6.0
	10	8.0 - 12.0
10 cm²	1	0.8 - 1.2
	5	4.0 - 6.0
	10	8.0 - 12.0
	15	12.0 - 18.0
	20	16.0 - 24.0

FIGURE 5.6

5.9 Ultrasound Duty Cycle Test

This test is performed using only the 5 cm^2 Applicator.

A. Ultrasound Duty Cycle Test Procedures

1. Set up Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter per Operator's Instructions and fill test reservoir with Degassed Water.

WARNING

USE ONLY DEGASSED WATER IN POWER METER FOR TESTING ULTRASOUND APPLICATORS. USE OF OTHER TYPES OF WATER WILL CAUSE FALSE TEST RESULTS. SEE PAGE 10 FOR DEGASSED WATER RECIPES.

DO NOT AERATE WATER WHEN FILLING POWER METER.

2. Place an Applicator into the Power Meter retainer. As per Ohmic Manual, make certain the Applicator's aluminum face is submerged in the degassed water and centered directly over the S.S. cone.

3. "Zero" the Power Meter.

4. Turn the Ultrasound Therapy System on.

5. Press the button until "Watts" appears in the intensity area of the display.

6. Increase Intensity ( ) to maximum.

7. Press "Start".

8. Press the button until "10%" is displayed in the Duty Cycle area of the display.

9. Compare Power Meter readings to Figure 5.7 for each of the following Duty Cycle settings listed in the chart.

10. Press the button until "3.3 MHz" is displayed in the Frequency area of display. Repeat test and compare readings to Figure 5.7.

B. Ultrasound Duty Cycle Test Results

1. Duty Cycles fall within the specified ranges as listed in Figure 5.7.

a) Unit passed test

2. Readings fall outside specified ranges of Figure 5.7.

a) Possible bad Degassed Water in Power Meter.

b) Possible use of Power Meter other than Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter.

c) Possible bad or out of calibration Applicator.

d) Check Ultrasound Board.

e) Check Control Board.

DUTY CYCLE SPECIFICATIONS		
APPLICATOR SIZE	DUTY CYCLE	OUTPUT RANGE
5 cm^2	10%	0.8 - 1.2
	20%	1.6 - 2.4
	50%	4.0 - 6.0
	100% (Continuous)	8.0 - 12.0

FIGURE 5.7

6.1 General

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE AND/OR REMOVE BATTERY BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

A. Tools & Equipment Required

1. #1 Phillips Screwdriver

2. Flat Blade Screwdriver

6.2. Top & Bottom of Unit

A. Removing Top from Bottom

1. Place unit face down on a grounded work surface.

NOTE:
Use a clean, soft cloth or cushion underneath the display lens to prevent scratching or damage to the lens.

2. Remove the plynth from the bottom of the system. See Figure 6.1.

3. Remove the Mains Power Cord from the system. See Figure 6.1.

4. Remove Battery Cover with the Flat Blade Screwdriver and remove Battery from the system if equipped. See Figure 6.2.

5. Remove the Rear Fan Grill from the system to gain access to the two rear mounting screws. See Figure 6.2.

6. Remove the two front feet from the system to gain access to the two front screws. See Figure 6.3.

7. Remove the four mounting screws from the bottom housing using the #1 Phillips Screwdriver. See Figure 6.3.

8. Carefully separate the upper and lower housings of the system. It may be necessary to pry the housings apart at the Applicator Hook. See Figure 6.4.

9. Disconnect the Power Supply and Fan Harnesses from the Control PCB of the system. See Figure 6.4.

B. Installing Top to Bottom

1. With top laying face down, carefully place the bottom housing in position over the top housing.

2. Connect the Power Supply and Fan Harnesses to the Control PCB onto their respective connectors.

3. Make certain the front insert and the Applicator Hook are in position, then lightly press housings together to properly seat them.

4. Secure housings together with the four phillips head screws.

NOTE:
Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

5. Follow Steps 1 - 7 in 6.2, A above in reverse order to complete reassembly of system.

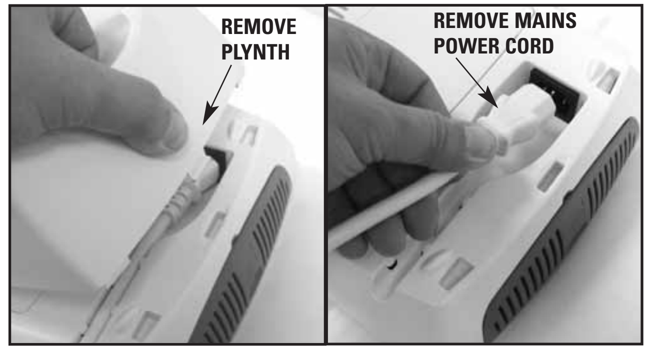


FIGURE 6.1

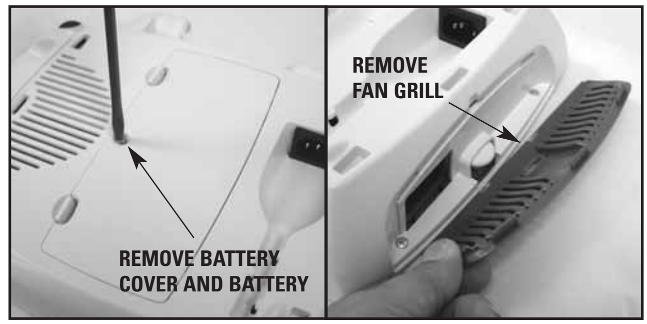


FIGURE 6.2

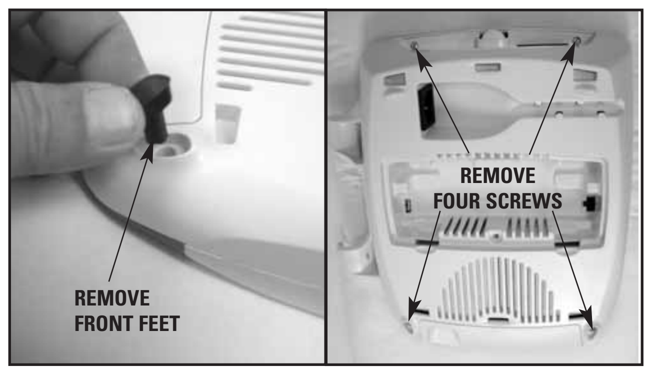


FIGURE 6.3

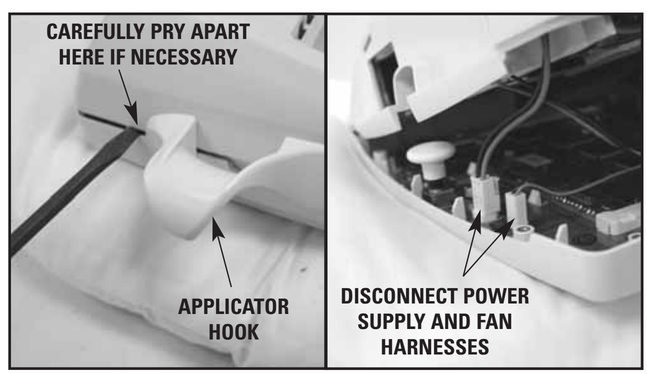


FIGURE 6.4

6.3 Fan Removal & Replacement

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

A. Fan Removal

1. Separate Top from Bottom. Refer to 6.2, part A.

2. With #1 Phillips screwdriver, remove the 2 screws securing the Fan. See Figure 6.5.

3. Remove Fan from the unit.

4. Remove Fan Baffle from fan. See Figure 6.5.

B. Installing Fan

1. Route Fan Harness underneath fan as shown in Figure 6.6.

2. Install Fan Baffle onto fan as shown in Figure 6.6.

3. Place new Fan, Part Number 27266, into system base.

4. Make certain the Fan Baffle sits onto System Housing Baffle Tabs as shown in Figure 6.7.

5. Secure fan to housing with the 2 mounting screws. See Figure 6.8.

NOTE:

Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

6. Reassemble the Top and Bottom Housing. Refer to 6.2, part B.

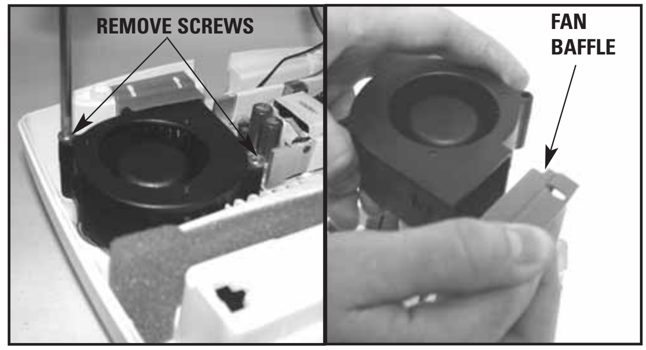


FIGURE 6.5

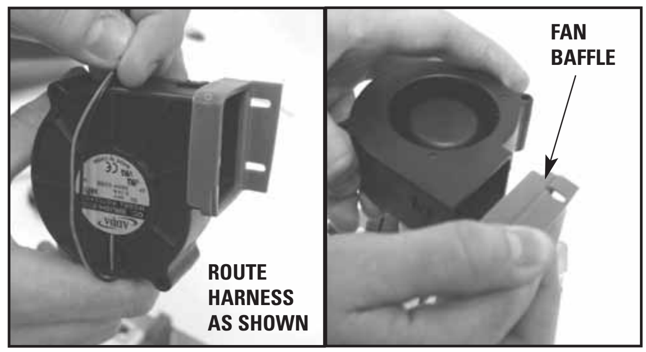


FIGURE 6.6

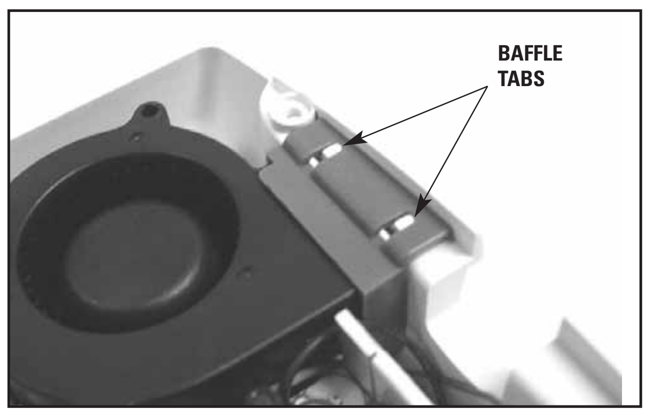


FIGURE 6.7

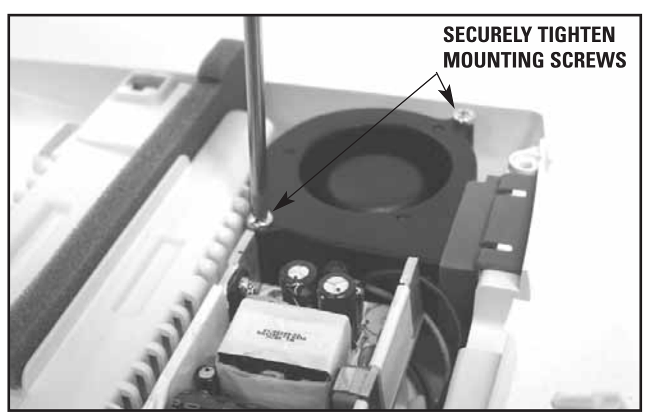


FIGURE 6.8

6.4 Power Supply Removal & Replacement

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

⚠ DANGER

IF POWER SUPPLY HAS FAILED HI-POT TEST, IT WILL RETAIN HIGH VOLTAGE IN THE POWER SUPPLY CAPACITOR C4. DISCHARGE CAPACITOR USING A MULTIMETER PRIOR ANY SERVICE OF THE POWER SUPPLY

A. Power Supply Removal

1. Separate Top from Bottom. Refer to 6.2, part A.

2. Discharge Power Supply Capacitor, C4, with multimeter.

3. With #1 Phillips screwdriver, remove the 2 screws securing the Power Supply. See Figure 6.9.

4. Lift Power Supply and disconnect the Power Supply Harnesses from the Mains Disconnect. See Figure 6.10.

5. Remove Power Supply from system.

B. Installing Power Supply

1. Route Power Supply PCB Harness of new Power Supply, Part Number 27265, as shown in Figure 6.11.

2. Connect Power Supply Mains Harness to Mains Disconnect as shown in Figure 6.10

3. Make certain the Power Supply sits onto alignment pins as shown in Figure 6.12.

5. Secure Power Supply to housing with the 2 mounting screws. See Figure 6.9.

NOTE:

Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

6. Reassemble the Top and Bottom Housing. Refer to 6.2, part B.



FIGURE 6.9

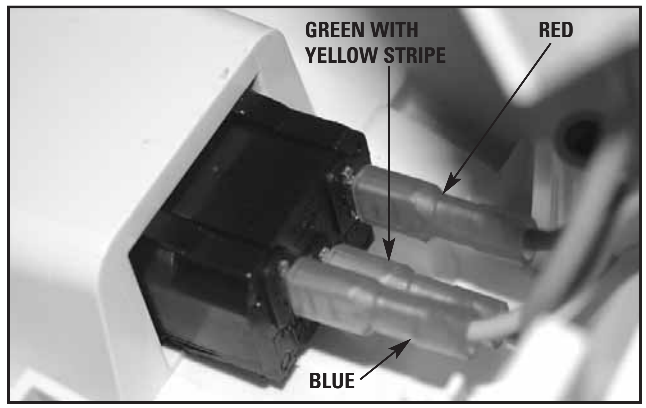


FIGURE 6.10

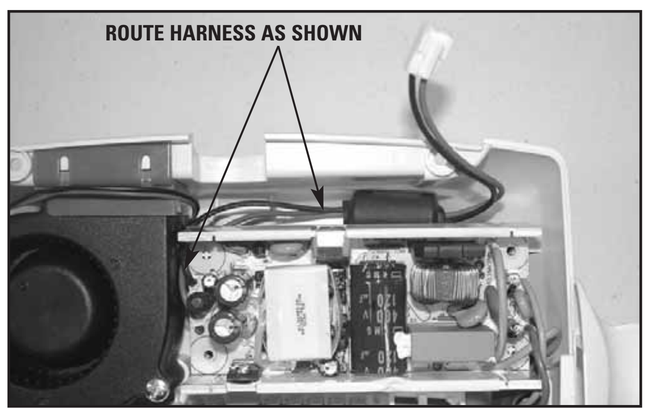


FIGURE 6.11

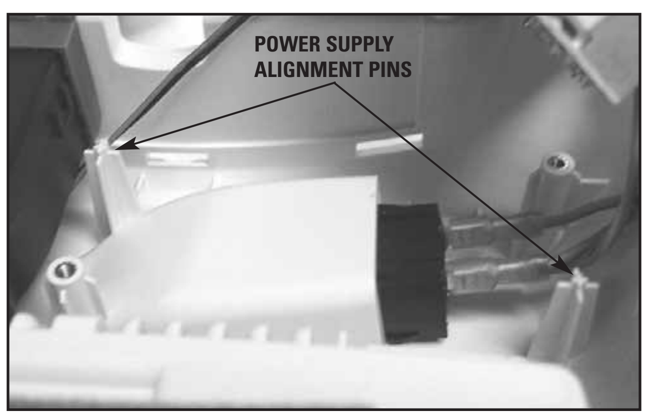


FIGURE 6.12

6.5 Ultrasound Board Removal & Replacement

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

A. Ultrasound Board Removal

1. Separate Top from Bottom. Refer to 6.2, part A.
2. With #1 Phillips screwdriver remove the 4 screws securing the Ultrasound Board to the unit. See Figure 6.13.
3. Carefully remove Ultrasound Board from the Control Board/Ultrasound Board Connector. See Figure 6.14.
4. Remove Control Board/Ultrasound Board Connector from the Control Board. Be careful not to bend or damage any of the pins. See Figure 6.14.

B. Installing Ultrasound Board

1. Install Control Board/Ultrasound Board Connector into new Ultrasound Board, Part Number 27269.

NOTE:
Install the connector with the long pins inserted into Ultrasound Board. Make certain connector is completely seated against Ultrasound Board. See Figure 6.15.

2. Place new Ultrasound board as shown in Figure 6.16 over Control Board and align connector pins up with Control Board Connector.
3. Carefully press the connector and board into place until the connector is completely seated into Control Board.
4. Secure Ultrasound Board with the 4 retaining screws.

NOTE:

Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

5. Reassemble the Top and Bottom Housing. Refer to 6.2, part B.

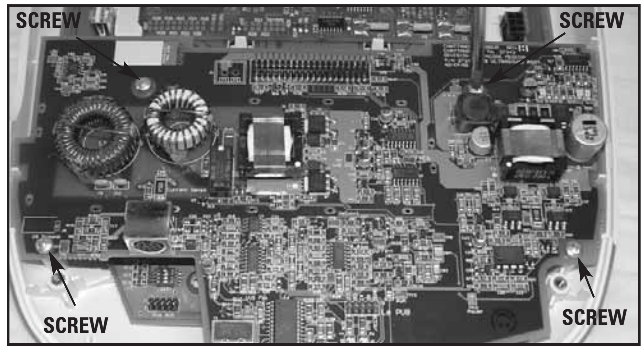


FIGURE 6.13

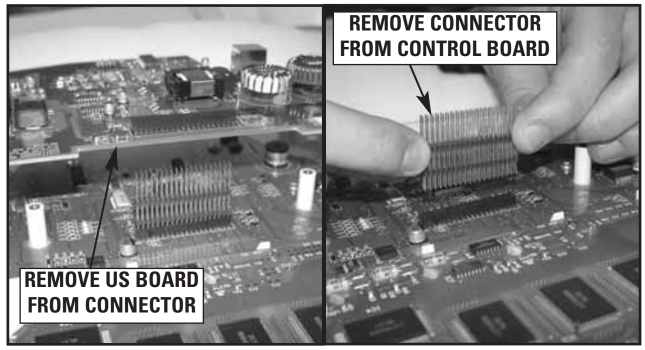


FIGURE 6.14

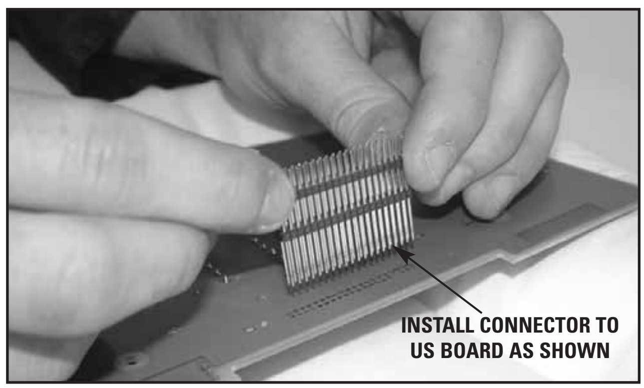


FIGURE 6.15

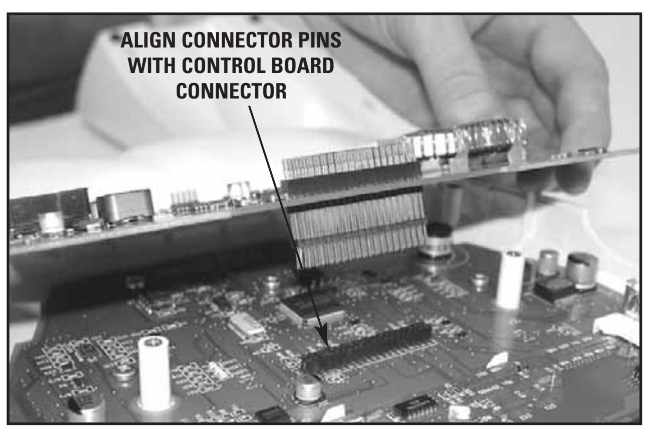


FIGURE 6.16

6.6 LCD Display Removal & Replacement

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

A. LCD Display Removal

1. Separate Top from Bottom. Refer to 6.2, part A.

2. Remove Ultrasound Board. Refer to 6.7, part A.

3. Remove the 4 LCD retaining screws. See Figure 6.17.

4. With a flat blade screwdriver, gently push in and up on each end of the LCD retaining brackets to free the locking tabs from the Control Board. See Figure 6.17.

5. Set retaining brackets aside for reassembly.

6. Carefully remove the LCD from the Control Board being careful not to damage the LCD connector pins. See Figure 6.18.

B. Installing LCD Display

1. Reinstall the two LCD Retaining Brackets onto new LCD Display, Part Number 27264. See Figure 6.19.

2. Place LCD Display over Control Board and align the LCD Connector pins with the top row on the Control Board LCD Connector. See Figure 6.18.

3. Secure LCD Display with the 4 retaining screws. See Figure 6.17.

NOTE:

Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

4. Reinstall the Ultrasound Board. Refer to 6.7, part B.

5. Reassemble the Top and Bottom Housing. Refer to 6.2, part B.

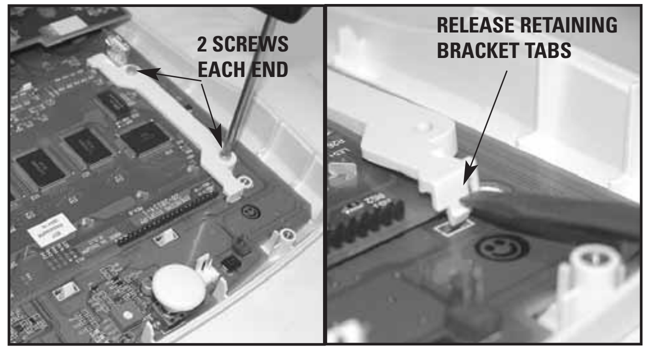


FIGURE 6.17

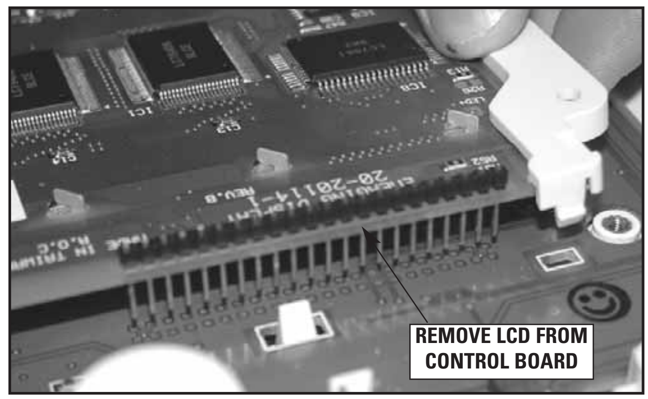


FIGURE 6.18

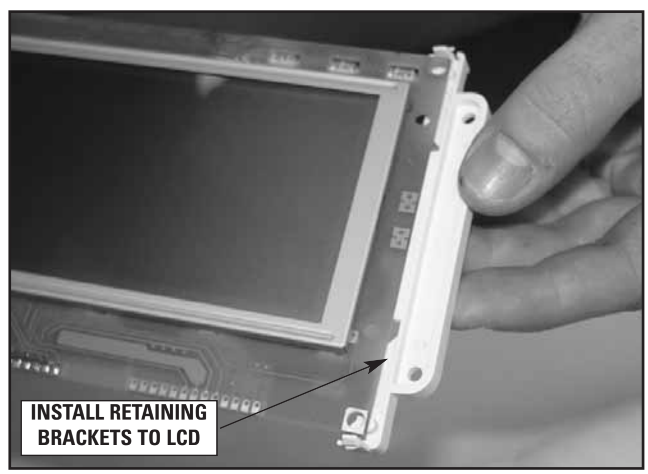


FIGURE 6.19

6.7 Control Board Removal & Replacement

⚠ WARNING

UNPLUG THE UNIT FROM THE POWER SOURCE BEFORE ATTEMPTING ANY REMOVAL OR REPLACEMENT PROCEDURES TO PREVENT ELECTRICAL SHOCK.

A. Control Board Removal

1. Separate Top from Bottom. Refer to 6.2, part A.
2. Remove Ultrasound Board. Refer to 6.7, part A.
3. Remove LCD from Control Board. Refer to 6.6, part A.
4. Remove the 7 retaining screws securing the control board to the housing. See Figure 6.20.
5. Using a flat blade screwdriver, carefully push locking tabs while lifting the Control Board to release Control Board from Housing. See Figure 6.21.
6. Remove the LCD Contrast knob for installation on the new Control PCB. See Figure 6.22.

B. Installing Control Board

1. Place new Control Board, Part Number 27249, over the locking tabs and push Control PCB down until locking tabs capture the Control PCB.
2. Secure Control PCB to housing with 7 retaining screws. Refer to Figure 6.20.

NOTE:

Do not overtighten the screws. Overtightening will damage the threads of the brass inserts.

3. Install LCD Display Contrast Knob. See Figure 6.22. Make certain Knob is completely seated on potentiometer.
4. Install LCD to Control PCB. Refer to 6.6, part B.
5. Install Ultrasound Board. Refer to 6.7, part B.
6. Re-assemble Top to Bottom. Refer to 6.2, part B.

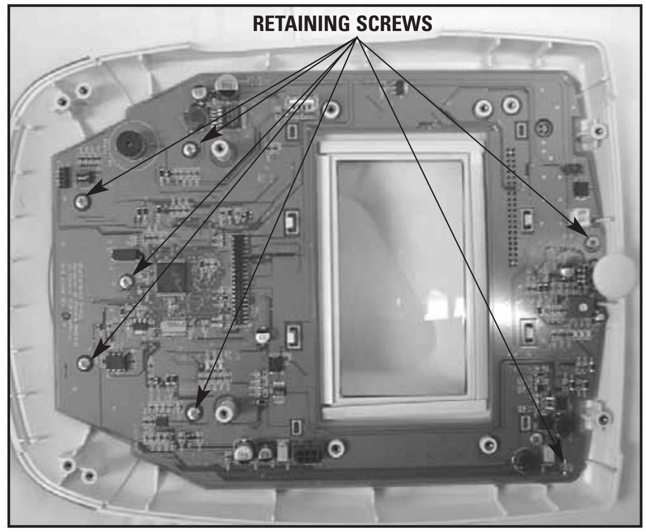


FIGURE 6.20



FIGURE 6.21

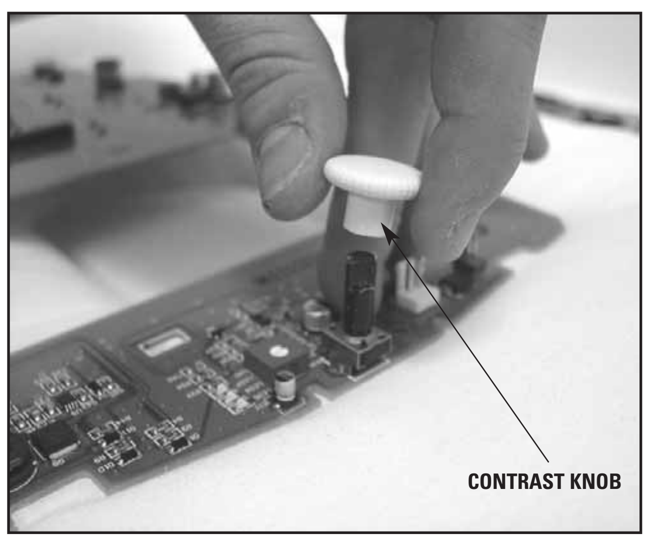


FIGURE 6.22

7.1 General

A. Tools and Equipment Required

1. Ultrasound Therapy System being serviced.
2. All Ultrasound Applicators for the unit being serviced.
3. Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter, set to “watts”.
4. Degassed Water. Refer to page 10 for Degassed Water Recipes.

> **⚠ WARNING**
>
> **USE ONLY DEGASSED WATER IN POWER METER FOR CALIBRATING ULTRASOUND APPLICATORS.**
>
> **USE OF OTHER TYPES OF WATER WILL CAUSE FALSE READINGS AND BAD TEST RESULTS.**
>
> **SEE PAGE 10 FOR DEGASSED WATER RECIPES.**
>
> **USE OF OTHER BRANDS OR TYPES OF TOOLS, EQUIPMENT, FIXTURES, MATERIALS AND SUPPLIES OTHER THAN THOSE SPECIFICALLY LISTED IN “A. Tools and Equipment Required” ABOVE WILL GIVE BAD TEST AND CALIBRATION RESULTS.**
>
> **IF PROPER EQUIPMENT IS NOT AVAILABLE OR CAN NOT BE OBTAINED, SEND THE ULTRASOUND APPLICATORS TO THE FACTORY FOR CALIBRATION.**

B. Ultrasound Applicator Calibration Procedures

1. Perform the following on all Ultrasound Applicators for the unit being serviced at least annually.
2. With the system on, press the Clinical Resources button once. See Figure 7.1.
3. Simultaneously press and hold the Treatment Time and Intensity Down buttons for approximately 2 seconds. See Figure 7.2. The calibration procedures screen should display.
4. Press the icon once to highlight “Calibrate Applicator”.
5. Press the W W/cm² icon once to select.
6. Place the Ultrasound Applicator being calibrated into the Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter and set meter to “watts”. See Figure 7.3.
7. Follow the instructions on the LCD Display.
8. When calibration is complete, place another applicator on the Ohmic Instruments UPM DT 10 or UPM DT 100 Ultrasound Power Meter and repeat steps 1 through 6 above.



FIGURE 7.1



FIGURE 7.2

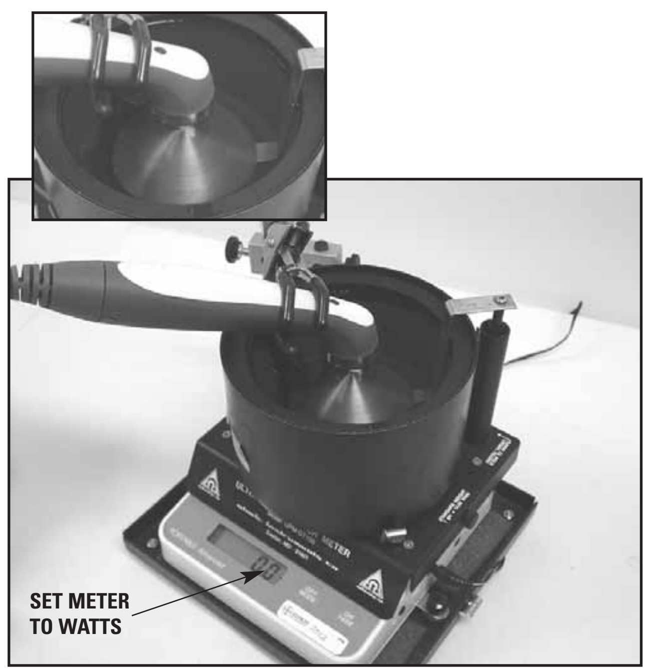
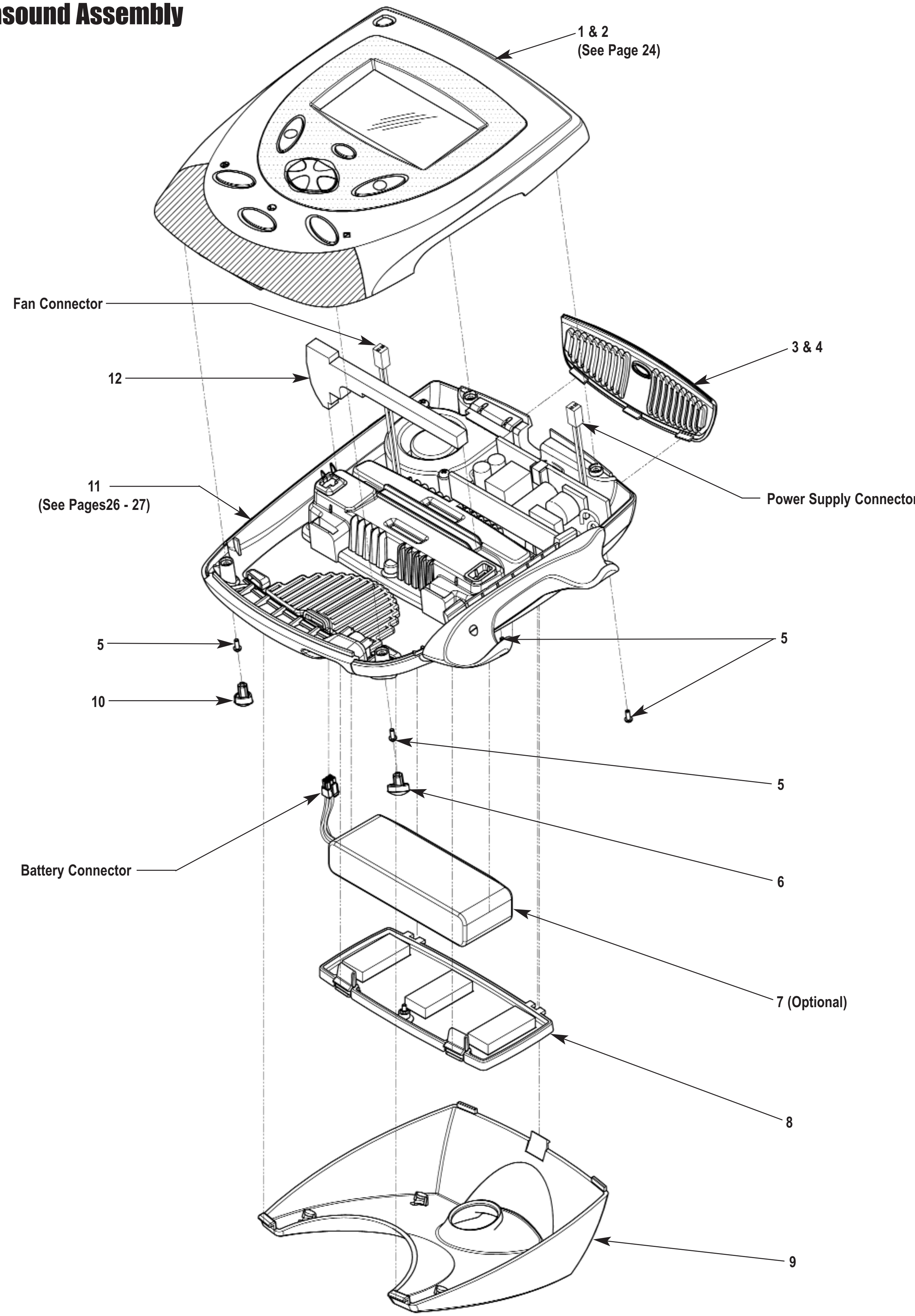


FIGURE 7.3

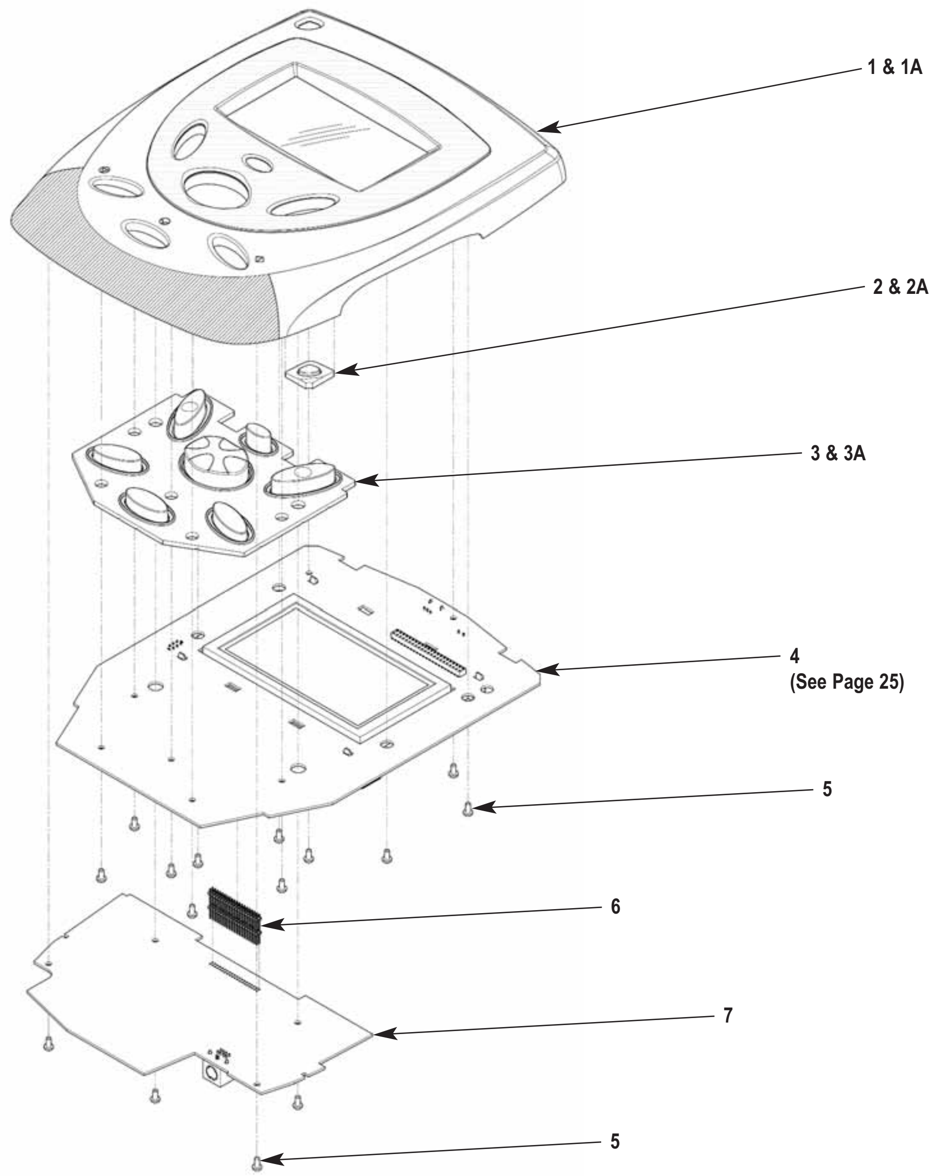
Ultrasound Assembly



Ultrasound Assembly

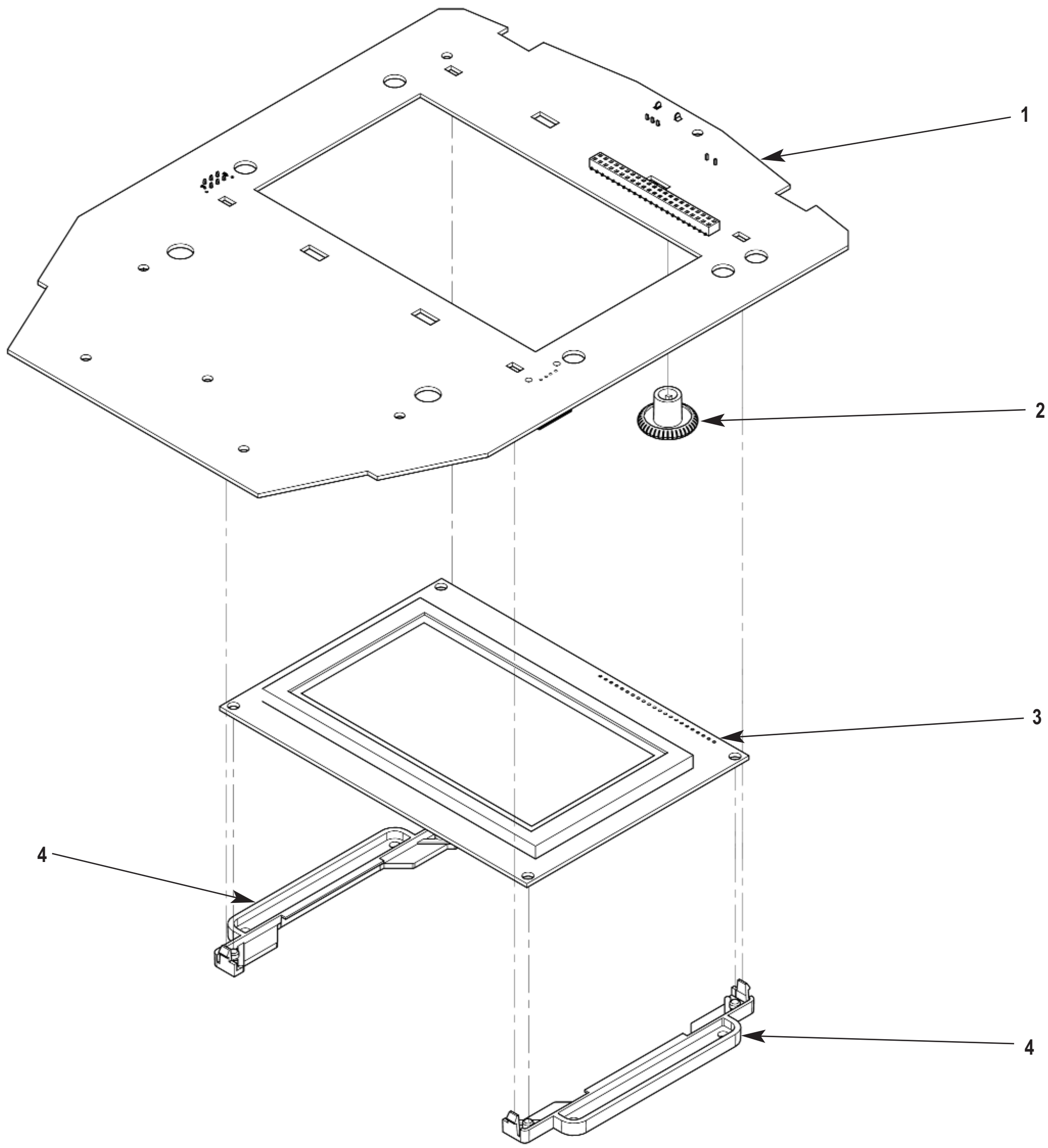
ITEM NUMBER	PART NUMBER	DESCRIPTION	QTY REQ'D
1	27402	Top Assembly (Grey)- See page 24 for breakdown	1
2	27247	Top Assembly (Blue)- See Page 24 for breakdown	1
3	27361	Rear Vent (Grey)	1
4	27363	Rear Vent (Blue)	1
5	27142	M3 x 6mm S.S. Pan Head Screw	4
6	27365	Right Foot	1
7	27267	Battery Pack (Optional)	1
8	27410	Battery Compartment Cover Assembly	1
9	27253	Plynth	1
10	27363	Left Foot	1
11	27409	Bottom Assembly- See Pages 26-27 for breakdown	1
12	27373	Baffle	1

Ultrasound Top Assembly



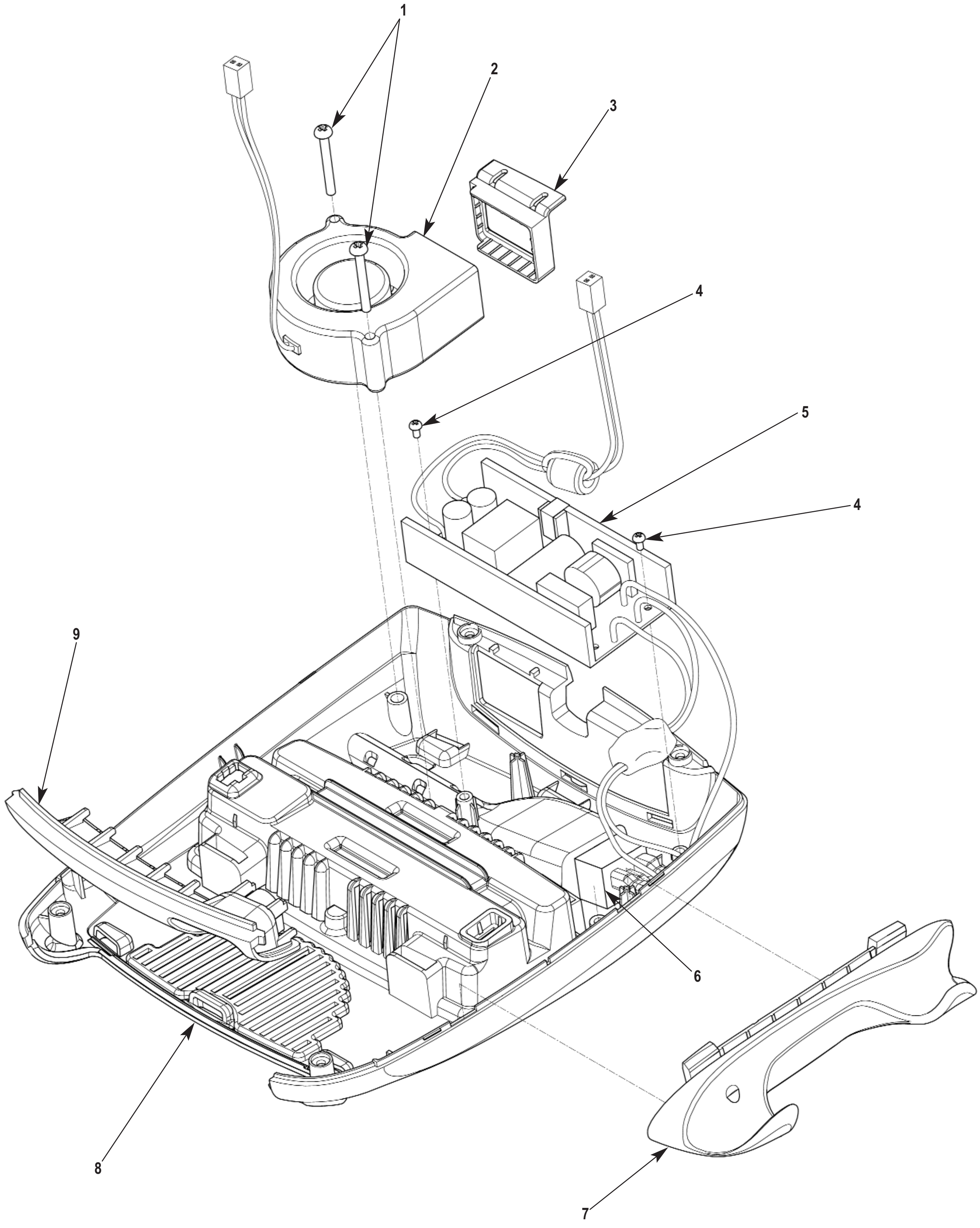
ITEM NUMBER	PART NUMBER	DESCRIPTION	QTY REQ'D
1	27552	Top Moulding Assembly (Grey)	1
1A	27553	Top Moulding Assembly (Blue)	1
2	27370	Power Button (Grey)	1
2A	27262	Power Button (Blue)	1
3	27368	Keymat (Grey)	1
3A	27561	Keymat (Blue)	1
4	27249	Control PCB Assembly- See Page 25	1
5	27142	M3 x 6mm S.S. Pan Head Screw	15
6	27588	PCB Connector- Ultrasound PCB to Control PCB	1
7	27269	Ultrasound PCB Assembly	1

Ultrasound Control PCB Assembly



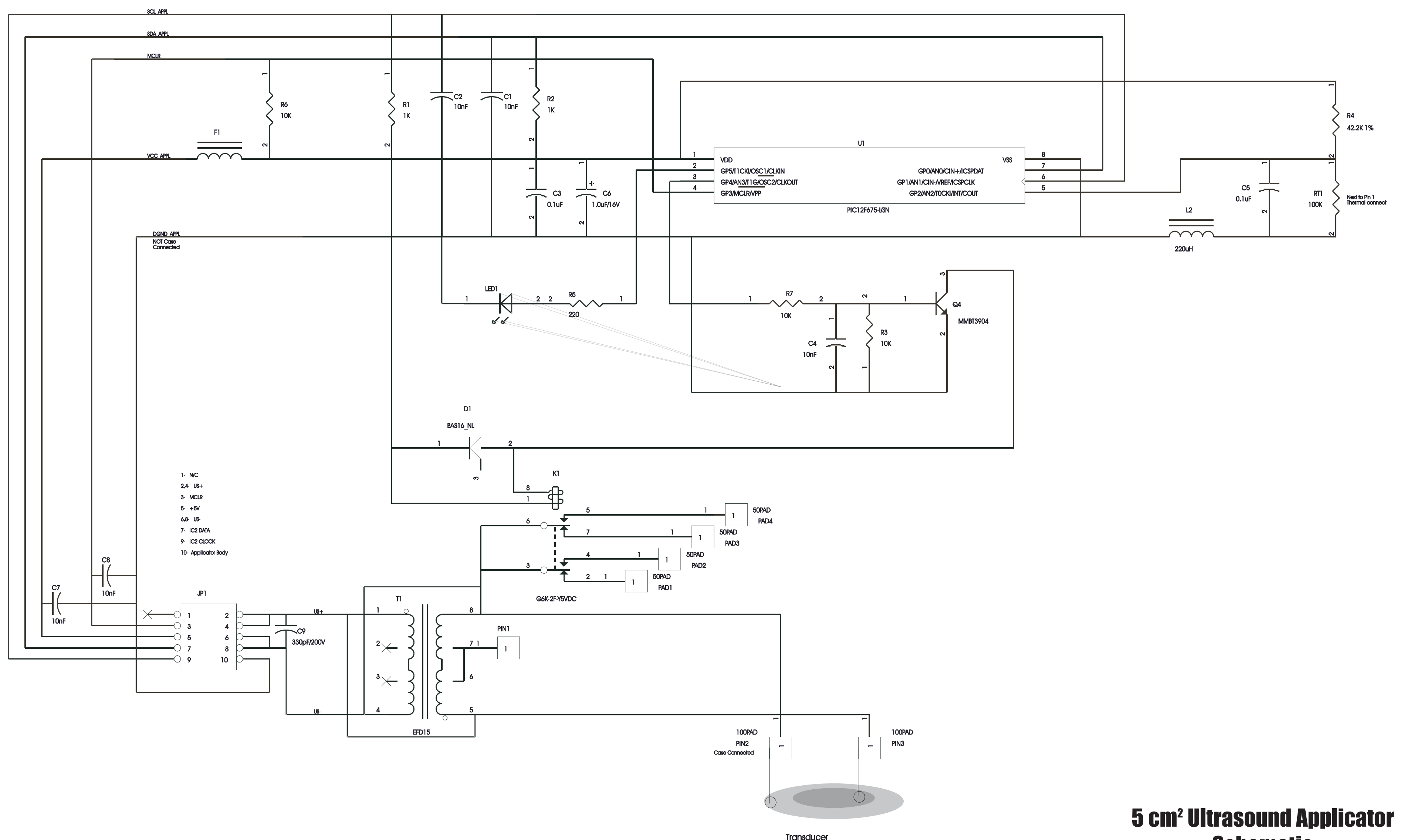
ITEM NUMBER	PART NUMBER	DESCRIPTION	QTY REQ'D
1	27268	Control PCB	1
2	27012	Contrast Knob	1
3	27264	Transportables LCD	1
4	27261	LCD Spacer	2

Ultrasound Bottom Assembly



Ultrasound Bottom Assembly

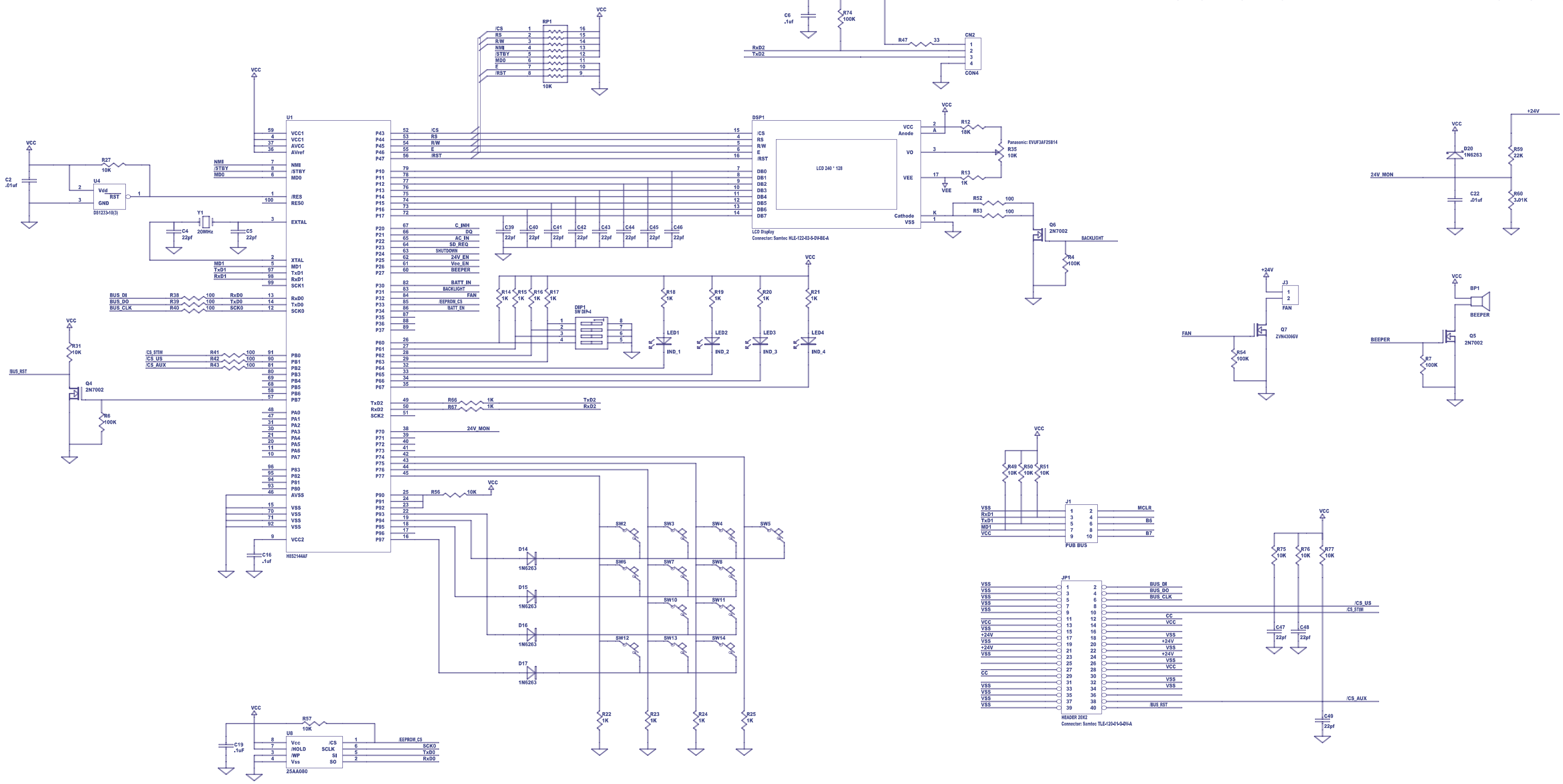
ITEM NUMBER	PART NUMBER	DESCRIPTION	QTY REQ'D
1	27136	M4 x 35mm S.S. Pan Head Screw	2
2	27266	Fan	1
3	27367	Fan Seal	1
4	27142	M3 x 6mm S.S. Pan Head Screw	2
5	27265	Power Supply	1
6	27277	Universal Snap-In Inlet	1
7	27256	Applicator Hang-Up	1
8	27252	Base	1
9	27259	Ultrasound Connector Infill	1



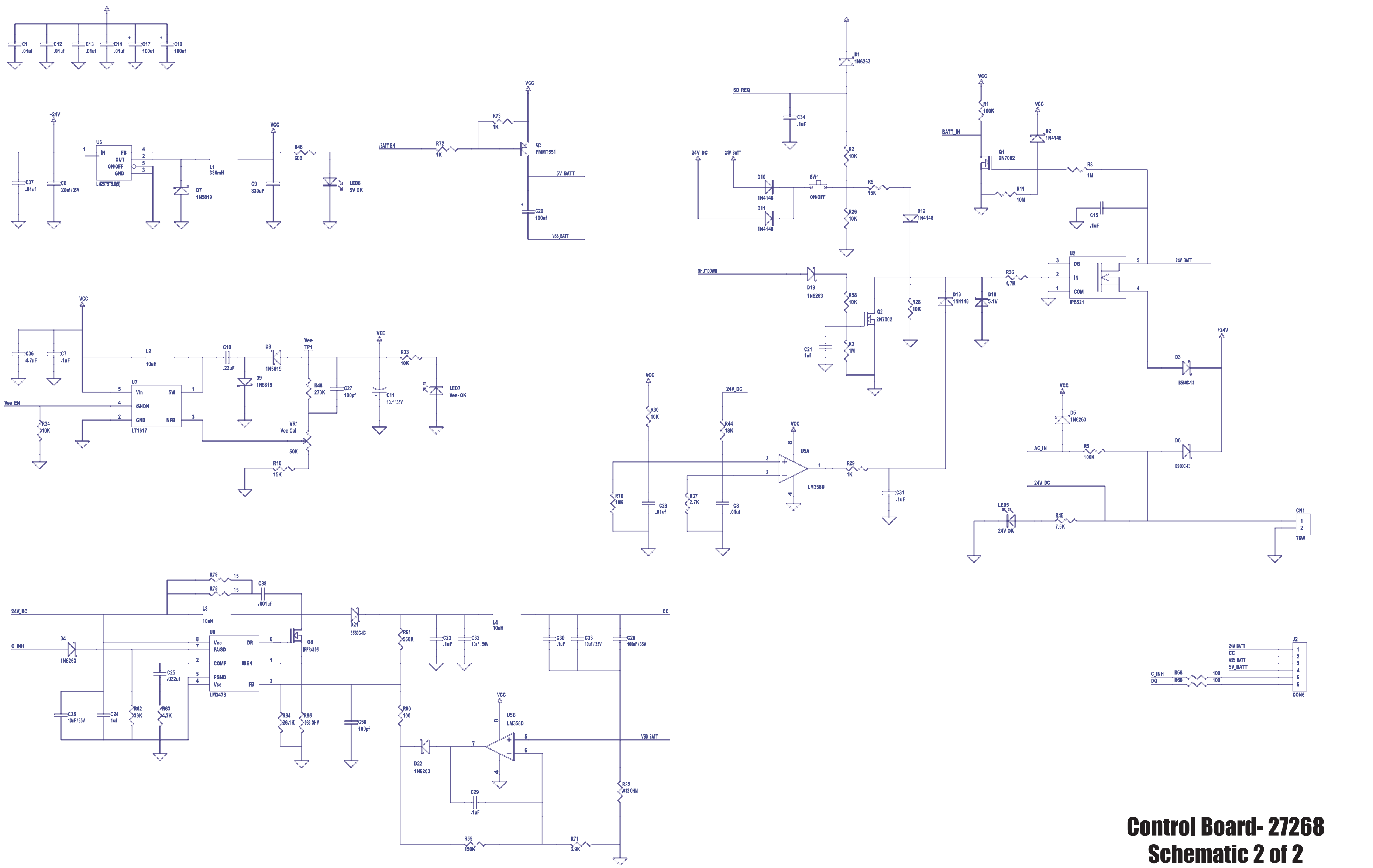
5 cm² Ultrasound Applicator Schematic

REVISIONS

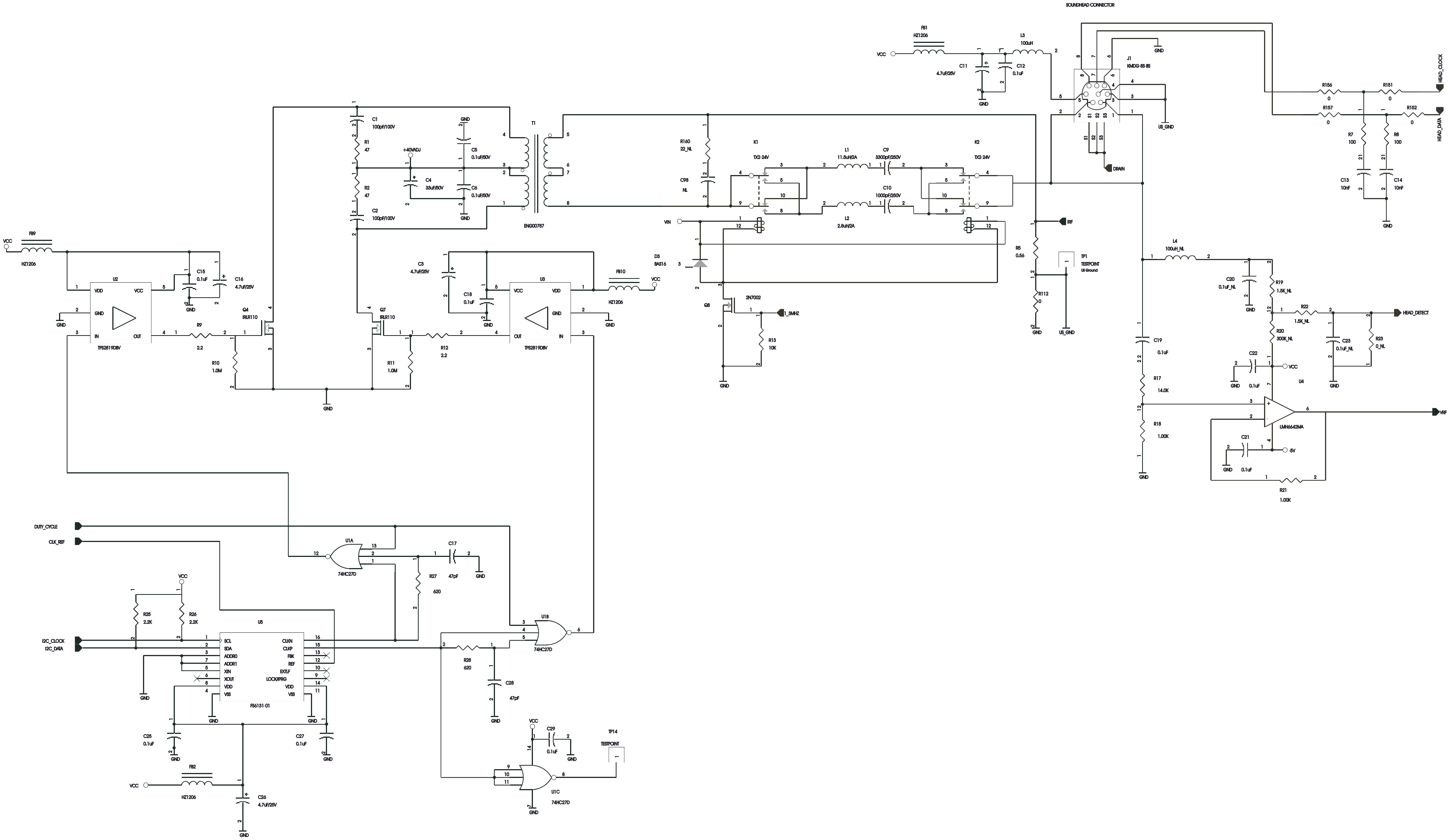
REV	E.N. NO.	DATE	DESCRIPTION	BY	CHECK	ENGINEER	APPROVAL
D		4/30/04	Released for Production	MWM		MWM	
E			a) Added R74 - Pullup for serial input line b) Added Shield box - battery charger	MWM		MWM	
F			Changed C32 to 50V	MWM		MWM	



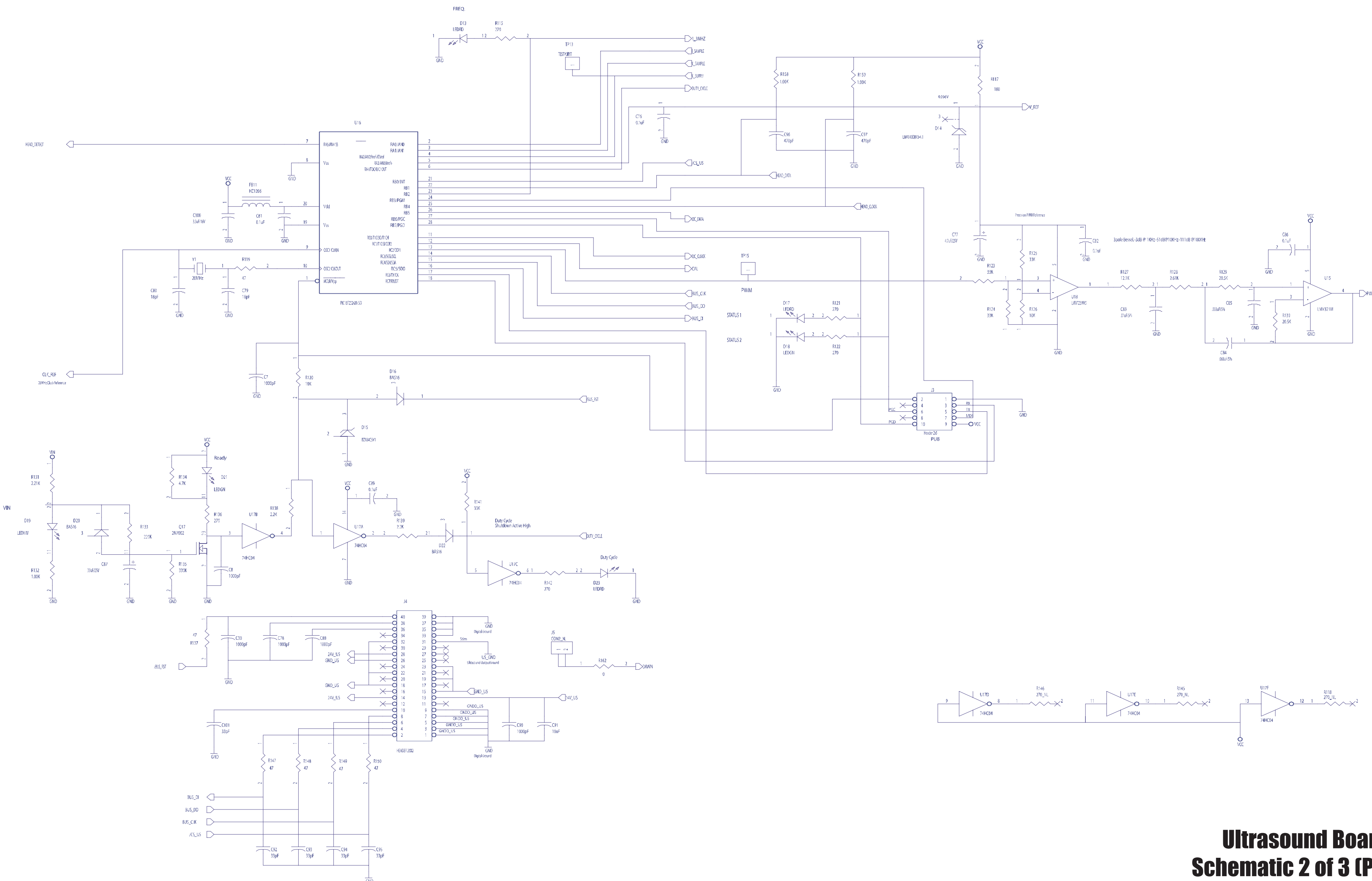
Control Board- 27268
Schematic 1 of 2



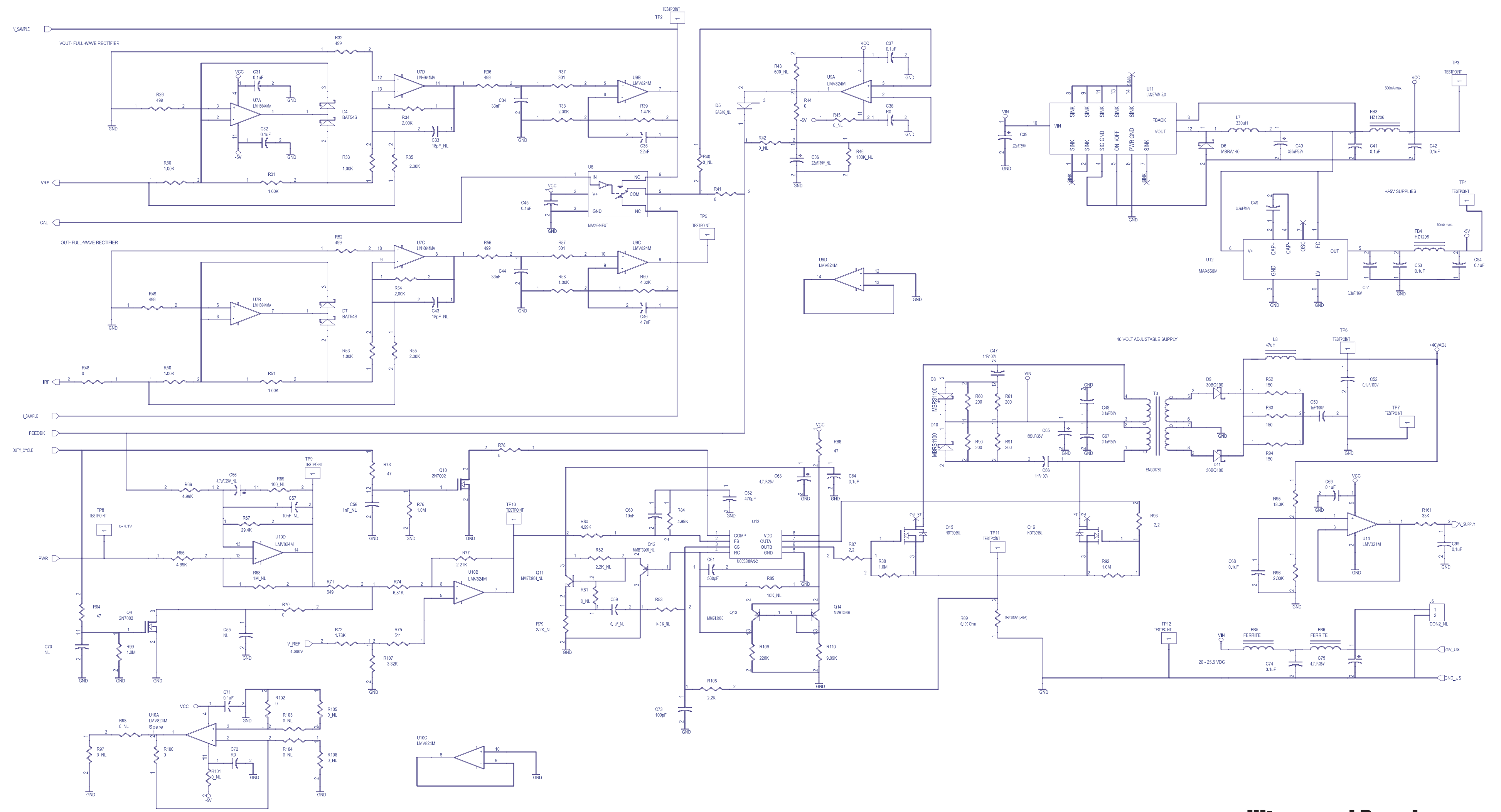
Control Board- 27268
Schematic 2 of 2



Ultrasound Board
Schematic 1 of 3 (AMP)



Ultrasound Board
Schematic 2 of 3 (Ports)



Ultrasound Board
Schematic 3 of 3 (V Supply)

Chattanooga Group ("Company") warrants that the Ultrasound Therapy System("Product") is free of defects in material and workmanship. This warranty shall remain in effect for two years (24 months) from the date of original consumer purchase. If this Product fails to function during the two years warranty period due to a defect in material or workmanship, Company or the selling dealer will repair or replace this Product without charge within a period of thirty (30) days from the date on which the Product is returned to the Company or the dealer.

All repairs to the Product must be performed by a service center certified by the Company. Any modifications or repairs performed by unauthorized centers or groups will void this warranty.

The warranty period for applicators is one year (12 months).

This Warranty Does Not Cover:

Replacement parts or labor furnished by anyone other than the Company, the selling dealer or a certified Company service technician.

Defects or damage caused by labor furnished by someone other than Company, the selling dealer or a certified Company service technician.

Any malfunction or failure in the Product caused by product misuse, including, but not limited to, the failure to provide reasonable and necessary maintenance or any use that is inconsistent with the Product User's Manual.

COMPANY SHALL NOT BE LIABLE IN ANY EVENT FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

To Obtain Service From Company or the selling dealer under this warranty:

1. A written claim must be made within the warranty period to the Company or the selling dealer. Written claims made to the Company should be sent to:

    4717 Adams Road
    Hixson, TN 37343 USA
    Telephone: +1 423 870-7200
    FAX: +1 423 870-2046

    and

2. The Product must be returned to the Company or the selling dealer by the owner.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state or location to location.

The Company does not authorize any person or representative to create for it any other obligation or liability in connection with the sale of the Product. Any representation or agreement not contained in the warranty shall be void and of no effect.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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Massage Tables & Chairs
A.E.R.™ Boot
Auto Edema Reduction Boot
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Cambion®
Shock Dampening Foot Care Products
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Carpal-Trac™
Carpal Traction Accessory
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SensaFlex™
Hot/Cold Pack
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